ments of links above and below the balls are symmetrical, then the centre weight has double the vertical movement of the balls, and in making calculations each ball is assumed to have a mass equal to the centre weight pulling it down, but not rotating with it, in addition to its own weight. Figs. 20, 21.

Let w lb. be the weight of each ball, and W lb. the weight of central load. The forces acting on the collar are the load W and the tensions T_1 and T_2 on the links, *abc* is the force diagram for these. The forces acting on each ball are the weight of ball w, the tensions T_2 and T_3 in links, and the centrifugal force F. *cbed* is the force diagram for these four forces. Fig. 22.

If h is height and r is radius of cone, then by similar triangles:

$$\frac{W+w}{F} = \frac{h}{r}$$

$$\frac{W+w}{\frac{w}{g}\cdot\frac{4\pi^2 n^2 r^2}{r}} = \frac{h}{r}$$

$$h = \frac{g}{4\pi^2 n^2}\cdot\frac{W+w}{w} = \frac{35{,}200}{n^2}\cdot\frac{W+w}{w}$$

if h is in inches and n is revolutions per minute; i.e. height of cone for loaded governor = height of cone for unloaded governor $\times \frac{W+w}{w}$.

It is obvious then that any increase given to the value of central load W will increase the value of h. The sensitiveness of the governor remains the same, however. Let n and N be the speeds for an unloaded and loaded type respectively for a height of cone h.

Then $h = \frac{35{,}200}{n^2}$ (unloaded type),

$h = \frac{35{,}200}{N^2} \times \frac{W+w}{w}$ (loaded type);

$$\therefore \frac{35{,}200}{n^2} = \frac{35{,}200}{N^2} \times \frac{W+w}{w}$$

or $N^2 : n^2 = (W+w) : w$.

Suppose the range of speed for an unloaded governor was from 60 to 70 r.p.m. Then for lowest position of loaded governor, taking W = 40 lb. and w = 3 lb.,

$$N^2 : n^2 = (W + w) : w$$

$$N^2 : 3600 = 43 : 3$$

$$N^2 = \frac{3600 \times 43}{3}$$

$$\therefore N = 227 \text{ r.p.m.}$$